Some Observations on the Fern Weevil (Syagrius fulvitarsis Pascoe) in the Kilauea Volcano Region of Hawaii National Park with Notes on Parasitism

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The introduced fern weevil was first discovered on the island of Hawaii at Hilo, by Brother Mathias Newell in 1908. It was previously discovered on Oahu in 1903, according to W. M. Giffard, and was observed on Maui for the first time on May 22, 1922.

The weevils apparently arrived in Honolulu in some potted plant material from Australia and were probably distributed to Hawaii from Oahu in the same manner. Fullaway ("The Fern Weevil," The Hawaiian Forester & Agr., 18, no. 5: 101-114, 1921) wrote (p. 102): ". . . It has now spread over the entire town [of Hilo] from Wainaku to Waiakea, in the fish-tail and Boston ferns, was recently discovered infesting Sadleria ferns at Kilauea, and is also reported from Ninole, seventeen miles north of Hilo on the railroad." About 1941 L. W. Bryan, Associate Forester, Hawaii, reported that the weevil had spread through forest reserve areas on Mt. Hualalai and killed the fronds on ferns over an area of about one-half mile.

In August of 1941, the writer made some brief observations on the fern weevil and noticed that the Sadleria ferns (*Sadleria cyatheoides*) were severely damaged in the administrative and residential areas, at the Hilo entrance to the park, and in the summer camp area. The preferred host was *Sadleria cyatheoides* and in heavy infestations the young shoots were either malformed or killed. The older fronds were sickly and many female excavations and adult emergence holes were observed along the stems. No dead plants were found, but severely injured ferns were retarded in growth.

Observations were resumed in September, 1944, and continued throughout 1945. It was found that the weevil had spread westward along the steam bluff trail and southward along the Halemaumau foot trail where damage was particularly severe. It had also extended its range to Makaopuhi where a small area of infestation was found. On July 19, 1945, it was noticed for the first time that adult weevils were feeding on the circinate buds of *Cibotium chamissoi* at the summer camp. The small stunted ferns were abraded in many places. Here, too, there was evidence that some of the Sadleria ferns had been killed by *Syagrius fulvitarsis,* apparently causing the weevil to seek food from Cibotium ferns. No emergence holes were seen on the tree fern stipes. Studies by Fullaway and Pemberton have also indicated *Cibotium* as a host.

In general there was some improvement noted in the Sadleria ferns over their 1941 condition. This may be due to the increasing number of *Ischiogonus syagrii* Fullaway, a parasite introduced by Dr. C. E. Pember-

ton in 1921 from Australia. The parasites were liberated on the island of Hawaii and have helped to keep the fern weevil population down. Pemberton (1928) in "Parasitism of the Fern Weevil *Syagrius fulvitarsis* Pascoe, at Kilauea, Hawaii," (The Hawaiian Planters' Record, 32, no. 3: 260) showed a percentage of 30.5 based on the assumption that an average of 2.5 parasites develop on one weevil larva. Amaumau (*S. cyatheoides*) stipes of several seasons ago examined at random showed few parasite emergence holes while those of the present season's growth show a definite increase.

On December 23, 1945, four parasites were observed ovipositing on a Sadleria stipe at the summer camp. Of this number, two of the parasites were *Eupelmus epilamprops* Perkins. The latter were previously reared from fern stipes and were identified by Dr. O. H. Swezey. The *Eupelmus* parasites did not seem to mind the presence of *Ischiogonus syagrii* and oviposited in close proximity to it.

In February and March, 1946, amaumau stipes were collected at various localities in Kilauea, waxed at each end and held in boxes under room temperatures in the National Park administration building. In the following table, it will be noted that 85 per cent of the adult emergences were *Ischiogonus syagrii* and 10 per cent were *Eupelmus epilamprops*. The relationship between *Eupelmus* and the fern weevil has not been definitely established but it is probably an unrecorded parasite of the fern weevil, *Syagrius fulvitarsis*.

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LITERATURE CITED

1. Fullaway, David T. 1921. The Fern Weevil. The Hawaiian Forester and Agriculturist, 18 (5):101-114.
2. Pemberton, C. E. 1928. Parasitism of the Fern Weevil, *Syagrius fulvitarsis* Pasc., at Kilauea, Hawaii. The Hawaiian Planters' Record, 32: 260.

Adult Emergences from 400 Fern Stipes Collected at Kilauea, Hawaii National Park

February 13 - March 17, 1946

Date	Date Coll. 2/12/46 Summer Camp (50 Stipes)			Date Coll. 2/14/46 Makaopuhi (50 Stipes)			Date Coll. 2/16/46 Park Utility Area (50 Stipes)			Date Coll. 2/21/46 Halemaumau F. Tr. (50 Stipes)			Date Coll. 3/6/46 Park Utility Area* (200 Stipes)		
	†	‡	§	†	‡	§	†	‡	§	†	‡	§	†	‡	§
2/13	5														
2/14	1			0											
2/15	1			1											
2/16	0			0			1	0							
2/17	3			0			0	0							
2/18	1			0			2	0							
2/19	1			1			3	0							
2/20	0			0			5	1							
2/22	0			0			3	0		0					
2/23	2			0			3	0		3					
2/24	1		1	0			1	0		1					
2/25	1	1		0			0	0	1	1					
2/26	1	0		0			2	1		1					
2/27	0	1		0			1	0		1					
2/28	2			0			0	0		1					
	19	2	1	2	0	0	21	2	1	8	0	0	0	0	0
3/1	4	1	0	0			2	1		2	0				
3/2	0	0	0	1			2	1		1	0				
3/3	1	0	0	0			3	1		4	0				
3/4	1	0	1	0			0	0		2	0				
3/5	0	0	0	1			0	0		0	0				
3/6	0	0	0	0			0	0		0	0		3	1	
3/7	1	0	0	1			1	0		0	0		5	1	
3/8	2	0	0	1			3	0		0	0		5	1	
3/9	0	1	0	1			3	0		0	1		4	0	
3/10	0	0	0	0			5	0		0	0		1	0	
3/11	2	0	0	0			2	0	1	0	0		2	2	
3/12	0	0	1	0			3	0	1	0	0		2	2	
3/13	3	0	0	1			0	0		0	0		8	0	
3/14	1	0	0	0			1	0		0	0		4	1	
3/15	0	0	0	0			1	0		0	0		12	0	
3/16	1	1	0	0			1	0	2	3	0		7	0	
3/17	0	0	2	0			0	0		0	0		2	0	
	35	5	5	8	0	0	48	5	5	20	1	0	55	8	0

* Note: Emergences for this locality incomplete, as writer was transferred to Maui.

†=Ischiogonus syagrii =166 or 85% of adult emergences.
‡=Eupelmus sp. = 19 or 10% of adult emergences.
§=Syagrius fulvitarsis = 10 or 5% of adult emergences.
Total =195